ASTRONOMICAL SOCIETY OF LONDON.

April 11, 1827. No. 3.

A PAPER by Colonel Beaufoy was read, containing his Observations of Eclipses of Jupiter's Satellites, from January 2 to May 15, 1826, together with some Observations of occultations of stars by the moon.

A paper was also read "On the Longitude of Madras, as deduced from Observations of Eclipses of the first and second Satellites of Jupiter, taken between the years 1817 and 1826. By John Goldingham, Esq. F.R.S."

The eclipses stated in this paper are 96 in number, being Immersions and Emersions of the 1st and 2d Satellites only. Of these, 11 are directly comparable with those of Colonel Beaufoy, made at Bushy Heath, viz. 8 of the 1st, and 3 of the 2d; and their mean result, which of course is independent of the errors of the tables, is stated by Mr. Goldingham at $5^h\ 21^m\ 9^s{\cdot}3$, being the longitude of Madras east of Greenwich. The remainder, consisting of 34 Emersions and 35 Immersions of the 1st Satellite, and 12 Emersions and 4 Immersons of the second, are not directly comparable with Colonel Beaufoy's. Mr. Goldingham endeavours, however, to render them so, or at least to eliminate the errors of the tables, by determining the latter from Colonel Beaufoy's observations made nearly about the same time, and then applying it to the results of a comparison of his own with the Nautical Almanac as a correction; and in this way deduces a conclusion agreeing almost exactly with the foregoing.

This is not the place to enter into any discussion on the legitimacy of the process pursued by Mr. Goldingham for this purpose, or of its general applicability in the present state of the tables. The end of this abstract will be better answered by presenting in one view the results of these several classes of observations as obtained separately, by direct comparison with the Nautical Almanac, *uncorrected* by reference to Colonel Beaufoy's, or any other observations, which may be stated as follows:

Madras East of Greenwich.

By 34 Emersions of the 1st Satellite observed at Madras, and compared with the Nautical Almanac	5^h	21^m	$6^s{\cdot}5$
By 35 Immersions of ditto, similarly observed and compared	5	21	12·4
Mean longitude of Madras	5	21	9·4
Difference of Immersions and Emersions			5·9

By 12 Emersions of the 2d Satellite, similarly observed and compared	5h	21m	0s·5
By 4 Immersions of ditto	5	21	33·1
Mean longitude	5	21	16·8
Difference of Immersions and Emersions			32·6

The latter series has, however, only the weight of four double observations, and is therefore no way to be put in competition with the former, corroborated as it is to minute precision by the results of the comparative observations; so that on the whole we may take $5^h\ 21^m\ 9^s{\cdot}35$ as the true longitude of the Madras observatory.

Mr. Goldingham states the difference of longitudes between the Observatory and Fort St. George at 2′ 21″ (of space), the latter being to the east; so that the longitude of Fort St. George, Madras, is $5^h\ 21^m\ 18^s{\cdot}7$.

Immediately after the conclusion of the ordinary meeting of the Society, a *Special General Meeting* was held, pursuant to a notice to that effect, for the purpose of distributing the Honorary Medals awarded by the Council; on which occasion the President read the following address.

Gentlemen,

The ordinary business of the evening being now terminated, it remains to fulfil the object for which we are especially convened this night, which is one of no less interest than the distribution of the Honorary Medals awarded by your Council, in pursuance of the principle of encouraging works of great labour, and high practical utility, steady perseverance in astronomical observation, and in redemption of the pledges held out in the address circulated at the origin of this Society, explanatory of its objects.

On former similar occasions when we have been called on to witness the execution of this important duty, it has frequently been our good fortune to acknowledge and applaud the claims of foreign merit, and to prove by our awards, that no mean jealousies, or narrow and mistaken views of national honour, are capable of blinding our judgment or biasing our decision; but that he who, whatever be the spot of earth he inhabits, most promotes the cause of astronomical science, is most our brother and our countryman. Yet, I am sure it will be gratifying to you to know that on this occasion ample scope has been found for selection in the merits of our own compatriots, and in the home list of our members. It is not that great and important astronomical works have not emanated from our continental neighbours: on the contrary, the spirit of research and discovery appears to have prevailed with extraordinary activity; and the last year has even witnessed the addition to our system of another of those singular bodies, the discovery of which has conferred so much lustre on the names of Halley and Encke. No less than three independent claimants to the almost simultaneous disclosure of this interesting fact may be enumerated; and this circumstance, while it marks the spirit of the age more forcibly perhaps than any trait which could be produced, must obviously render it impossible

for this Society to interfere or decide on the priority and rank of the competitors. But though unmarked by any tangible memorial of our approbation, the names of Biela, Clausen, and Gambart, will not the less be cherished among us, and enrolled by posterity in the choicest and most permanent annals of Astronomical celebrity.

It is, however, for labours of a very different kind that our medals are this day to be conferred. Labours, if less brilliant, yet more vital; if less associated with lofty speculations on the nature of the universe, yet more intimately linked with the practical uses of this world. The first award of your Council is that of a gold and silver medal, respectively, to your late excellent President Mr. Baily, and your indefatigable Secretary Mr. Stratford, for their joint labours in the construction of the Catalogue of 2881 principal fixed stars, which forms the Appendix to the second volume of the Memoirs of this Society.

A catalogue of stars may be considered in two very distinct lights, either as a mere list of objects placed on record, to fix on them the attention of astronomers, and to afford them matter for observation, or as a collection of well-determined zero points, offering ready means of comparing their observations with those of others, and of detecting and allowing for instrumental errors. In this light only I shall now consider it as chiefly of importance to the practical astronomer. It is for his uses that an amount of pains, labour, and expense, both national and individual, has been bestowed on the perfection of such catalogues, which, on a superficial view, must appear in the last degree lavish, but which yet has been no more than the necessity of the case demands. If we ask to what end magnificent establishments are maintained by states and sovereigns, furnished with master-pieces of art, and placed under the direction of men of first-rate talent and high-minded enthusiasm, sought out for those qualities among the foremost in the ranks of science:—if we demand *cui bono?* for what good a Bradley has toiled, or a Maskelyne or a Piazzi worn out his venerable age in watching? the answer is,—not to settle mere speculative points in the doctrine of the universe; not to cater for the pride of man, by refined inquiries into the remoter mysteries of nature,—to trace the path of our system through infinite space, or its history through past and future eternities. These indeed are noble ends, and which I am far from any thought of depreciating; the mind swells in their contemplation, and attains in their pursuit an expansion and a hardihood which fit it for the boldest enterprise.—But the direct practical utility of such labours is fully worthy of their speculative grandeur. The stars are the land-marks of the universe; and amidst the endless and complicated fluctuations of our system, seem placed by its Creator as guides and records, not merely to elevate our minds by the contemplation of what is vast, but to teach us to direct our actions by reference to what is immutable in his works. It is indeed hardly possible to over-appreciate their value in this point of view. Every well-determined star, from the moment its place is registered, becomes to the astronomer, the geographer, the navigator, the surveyor,—a point of departure which can never deceive or fail him,—the same for ever

and in all places, of a delicacy so extreme as to be a test for every instrument yet invented by man, yet equally adapted for the most ordinary purposes; as available for regulating a town clock, as for conducting a navy to the Indies; as effective for mapping down the intricacies of a petty barony, as for adjusting the boundaries of transatlantic empires. When once its place has been thoroughly ascertained and carefully recorded, the brazen circle with which that useful work was done may moulder, the marble pillar totter on its base, and the astronomer himself survive only in the gratitude of his posterity: but the record remains, and transfuses all its own exactness into every determination which takes it for a groundwork, giving to inferior instruments, nay even to temporary contrivances, and to the observations of a few weeks or days, all the precision attained originally at the cost of so much time, labour, and expense.

To avail ourselves of these records, however, we must first have the means of disentangling the observed places of the stars at any moment, from the regularly progressive effect of precession, and from a variety of minuter periodical inequalities arising from the nutation of the earth's axis, and from the aberration of light, of which the genius of theoretical, no less than the industry of practical, astronomers has at length succeeded in developing the laws, and fixing the amount, so as to leave little probability of any material change being induced by future researches.

The calculations, however, required for this purpose, if instituted for each particular star at the time it is wanted, are so numerous and troublesome as to become a very serious evil; the effects of which have been severely felt in Astronomy in the discouragement it has offered to the reduction of observations, owing to which the labour of many an industrious observer's life has been in great measure thrown away. Indeed a lamentable picture might be drawn of the waste of valuable labour traceable to this cause. The want of tables, therefore, to facilitate the reduction of particular stars was early felt. I shall not, however, enter into any historical detail of the attempts hitherto made from time to time to supply this desideratum. A well-drawn up and concise account of them is given in Mr. Baily's Preface to the Catalogue, which renders superfluous all I could say on the subject. Indeed, useful as they have been, and considerable as has been the pains bestowed on them, they are all so far surpassed by this work of Mr. Baily, that it ought rather to be considered as belonging to a new class, than to be compared in any way with the preceding ones, which must eventually all be superseded by it.*

It is time now to speak more particularly of the Catalogue itself. Its whole plan and arrangement, the selection of the stars, the preparation and revision of the formulæ, the choice of the coefficients,

* From this sentence, however, I ought to except special tables for the daily reduction of a certain number of select stars, whose use is no way superseded by the general Catalogue, being destined for continual, as the latter is only for occasional, reference.

and the discussion of the terms to be retained or rejected, we owe to Mr. Baily, who has stated every particular relating to it in a most elaborate Preface, which may indeed be regarded as a compendium of all that is known on the subject of the corrections, and is remarkable at once for its precision and perspicuity. A great portion of the computation has been gratuitously performed by Mr. Stratford, checked by a computer engaged for that purpose. From this very severe labour, however, he was unfortunately compelled to desist, I regret to say, by ill health, and his place supplied by a professional computer: but the hardly less laborious task of comparing and checking the computations of his assistants, and, what is as important in all such cases as accuracy of computation, the careful superintendence of the press, and repeated revision of the whole work, has entirely devolved on him; and never, I must say, was task performed with more diligence and exactness.

The selection of the stars has been made from the Catalogues of Flamstead, Bradley, Lacaille, Mayer, Piazzi, and Zach, so as to include all stars down to the 5th magnitude, wheresoever situated in the heavens,—all of the 6th within 30° of the equator, and all the stars to the 7th magnitude inclusive, within 10° of the ecliptic. Almost all of them, however, are to be found in the Catalogues of Bradley or Piazzi, from which they have been reduced to 1830, (the epoch adopted) by formulæ given by Bessel. Their number is so considerable, that in whatever part of the heavens we may be observing, one or more are sure to be within a moderate distance; so that no one provided with this Catalogue can possibly be at a loss for a zero-point to check his observations, and ascertain the state of adjustment of his instrument. To its convenience and utility, in this respect, I can speak from individual experience. It is indeed become my sheet anchor, and has infused into a series of observations wholly dependent on such aid, a degree of exactness which, without it, I should hardly have expected to attain.

The formulæ employed for calculating the corrections are almost entirely those of Bessel, who has laboured with such diligence and perseverance on this department of Astronomy, as to make the subject almost his own. In adopting them, however, Mr. Baily has taken nothing for granted, even from such high authority. He has gone over the whole subject anew; and the slight inaccuracies which he has detected and corrected in several of the results of this profound geometer, although almost insensible in a numerical point of view, are valuable, as proving at once the general accuracy of his investigations, and the minuteness of the scrutiny they have undergone.

The most delicate part of the whole operation, however, was the choice of the several coefficients, which, if erroneously assumed, would render the whole subsequent work of no value. In making this assumption, Mr. Baily has exercised a degree of judgment which I feel convinced will unite the suffrages of astronomers. Taking a comprehensive view of the results afforded by all former investigations, he has uniformly adhered to the principle, to steer

clear of extreme quantities, and to adopt only such as not only rest on the greatest number of the best observations, but agree in their values nearly with the average of all. Thus, in the case of the aberration, the value adopted is the mean of the almost miraculously coincident results of Brinkley and Struve, and agrees within two-hundredths of a second with that of the extreme values assigned by Bradley and Bessel. I have much satisfaction in being enabled to state, that this value has been recently confirmed within a very minute fraction of a second, by the praiseworthy zeal and industry of Mr. Richardson of the Royal Observatory, who has compared, for this purpose, upwards of 2000 observations, made with the two mural circles of Jones and Troughton; so that this datum may be regarded as one of the best established in Astronomy. In the same cautious manner has Mr. Baily proceeded with the other coefficients. That of precession he has taken entirely from Bessel's elaborate investigations compared with those of Laplace, in which the only remaining source of uncertainty is that arising from our ignorance of the mass of Venus; the influence of which cannot possibly produce an error, however, of a tenth of a second in the precession. The nutation he has taken, as it results from Dr. Brinkley's observations, which (like his aberration) justify this partiality by holding almost exactly an average value among all the different results of Bradley, Mayer, Maskelyne, Laplace, and Lindinau, and can hardly be considered as more than a tenth of a second in error.

This judicious choice will secure the present tables from a possibility of ever sharing the fate of preceding labours of this sort. They can never be superseded by others of greater accuracy, nor fall into disuse, or grow obsolete, till the apparent places of the stars shall have become so much altered by the effect of precession as to render the computations inexact, for which a very long series of years will be required.

But the distinguishing characteristic of this work is the adoption throughout of Professor Bessel's capital improvement in the system of applying the corrections, by arranging the formulæ in such a manner that all that is peculiar to each star, and permanent in magnitude, shall stand distinctly separated from all that is ephemeral, or varying from day to day; and that in such a manner that a short ephemeral table, capable of being compressed into a single page, shall serve, not only for these stars, but for every star in the heavens. The convenience of this method, the brevity it introduces into the computations, the distinctness it gives to all the process of reduction, requiring neither thought nor memory on the computer's part, give it an incalculable advantage over every other. To reduce any observation, no other book need be opened. The work occupies four lines, and is done in half that number of minutes. If we compare this with the tedious and puzzling operation required by former processes, we shall fully agree with Mr. Baily, that "those only who are versed in such calculations can appreciate the labour, the risk of error, and the loss of time incurred in their several operations;" all which are saved by the present arrangement.

These considerations will amply justify the award of your Council in your eyes and those of the world. They will justify a great deal more. At no time was the necessity of pressing on the attention of astronomers the utility, I may say, the duty, of uniformity in their systems of reduction more urgent than at present,* when hardly a nation in Europe is unprovided with a good observatory, and when rival astronomers in all quarters of the globe are contending for the palm of accuracy and diligence. So long as they persist in continuing to reduce their observations by different systems, their merits can never be fairly compared. Each may boast the perfection of his instruments, and vaunt himself in the security of his pre-eminence. Each may promulgate his standard Catalogue, which will be adhered to in his own nation, and rejected by all others; thus dividing astronomers into sects and parties,—a state of things which ought surely not to continue. The only remedy is to agree to speak one language, to adopt one system. It matters little in the present advanced state of science, whether that system be still open to infinitesimal corrections. Let astronomers only consent to use it as, like all human works, confessedly imperfect, and in process of time to be corrected: but not at the caprice of each individual who may think one coefficient a tenth of a second too small, or another as much too great; but after full consideration, when the necessity and amount of correction shall have become certainly known and generally agreed on.

Meanwhile, a fair opportunity is offered to rival astronomers throughout the world, to try their strength, in an arena of ample extent, and where every part of the honourable contest will be brought distinctly into sight. In giving this Catalogue to the world, we invite their examination to its errors, (for such it must contain), and call on them to lend their aid to its perfection, by determining, with all the exactness their resources afford, the mean places of the stars it comprises. For this, its arrangement affords every facility, and those who observe, have no excuse for neglecting to reduce. Let us hope then, that instead of lavishing their strength in fruitless attempts to give superhuman precision to fifty or a hundred select objects, the formation of a standard Catalogue of nearly 3,000 will be deemed of sufficient importance to fix the attention of astronomers; and that not only those to whom the direction of great national observatories is confided, but even private individuals, if such there be, who feel themselves in possession of the means required, may take a share in this glorious, but at the same time arduous undertaking.

(*The President then, delivering the Gold Medal to Mr. Baily, addressed him as follows:*—)

Mr. Baily,

Accept this Medal, which the Astronomical Society bestows on you, by an award which every astronomer in Europe will confirm.

* This applies with equal or greater force to the correction for refraction; a common table for which ought to be agreed on and adhered to by all.

The work you have accomplished will identify you with the future progress of that science, into almost every department of which it is calculated to infuse new life; since every practical astronomer has in it to thank you for an accession of power. It is needless for me to accompany this testimony of the sense the Society entertains of your distinguished merits, with the expression of a hope that your exertions in the cause of Astronomy will continue. You could not struggle against nature so far as to desist from pursuits which, demanding of ordinary men a total devotion of their time, and concentration of their whole intellectual powers, have been to you a relaxation from the most active business. Possessing thus within yourself a source of pure and exalted enjoyment, enhanced by the consciousness of public utility, and a certainty of the approval and admiration of those whom you esteem, we can only add our wishes that length of years, and continuance of health, may render your distinguished talents, and rare zeal for the promotion of your favourite science, as useful to Astronomy as it is honourable to yourself.

(*The President next presented the Silver Medal to Mr. Stratford, addressing him at the same time in these words:—*)

Mr. Stratford,

The Medal which, in the name of the Astronomical Society, I now deliver to you, though "less fine in carat" will, I trust, be to you "more precious" than gold, as proving how highly we appreciate your devoted and persevering attention to the work you have so happily brought to a conclusion. Those only who have actually entered into the details of a work of this nature can possibly understand the overwhelming and soul-sickening labour of such a task; but the pile of volumes now lying on the table, a great portion of which you have yourself penned, and the whole of which you must in the course of your undertaking have repeatedly read over, figure by figure, will serve to give some idea of it. In executing this arduous duty, you have had no other inducement than your zeal for the progress of science, and that devotion to the interest of this Society which is so conspicuous in every part of your conduct, and which would not suffer you to tolerate the idea of any incorrectness, any thing unworthy the importance of the subject emanating from it. The habits of correctness in numerical computation, and systematic fidelity of detail indispensable for such a work, you possess, though in perfection, yet in common with many: but the enthusiasm in the cause of abstract science, which could carry you successfully through the task thus voluntarily imposed on yourself, you share with few. You have, however, the satisfaction of knowing that so much labour has not been bestowed in vain; for, if there be any thing on which we can calculate with certainty, it is that the work you have been mainly instrumental in completing, must exercise a powerful influence on the future destinies of Astronomy.

(*The President then resumed his Address to the Members in general, as follows:—*)

Gentlemen,

We have still another, and a very interesting part of the business of this meeting to perform, in the delivery, to Colonel Beaufoy, of a Medal for his valuable series of observations of eclipses of Jupiter's satellites, communicated to this Society, and in part already printed in the first part of the second volume of our Memoirs; in part recently read at a late meeting, and completed up to the present time, by the paper you have heard read to-night.

The subject of the eclipses of Jupiter's satellites is one of singular interest in the history of Astronomy. The discovery of these bodies was one of the first brilliant results of the invention of the telescope; one of the first great facts which opened the eyes of mankind to the system of the universe — which taught them the comparative insignificance of their own planet, and the superior vastness and nicer mechanism of those other bodies, which had before been distinguished from the stars only by their motion, and wherein none but the boldest thinkers had ventured to suspect a community of nature with our own globe. This discovery gave the holding turn to the opinions of mankind respecting the Copernican system: the analogy presented by these little bodies (little, however, only in comparison with the great central body about which they revolve) performing their beautiful revolutions in perfect harmony and order about it, being too strong to be resisted. As if to confirm this analogy beyond dispute, Kepler lived just long enough to witness the discovery, and to demonstrate* the extension of the same general law to their periods which he had found to obtain among those of the primary planets about the sun. The conclusion was irresistible; and the full establishment of the Copernican System must date from the discovery of the satellites of Jupiter.

This elegant system was watched with all the curiosity and interest the subject naturally inspired; and the eclipses of the satellites speedily attracted attention, and the more when it was discerned, as it speedily was, by Galileo himself, that they afforded a ready method of determining the difference of longitudes of distant places on the earth's surface by observations of the instants of their disappearances and reappearances simultaneously made. Thus, the first astronomical solution of the great problem of the longitude,—the first mighty step which pointed out a connexion between speculative astronomy and practical utility, and which, replacing the fast-dissipating dreams of astrology by nobler visions, shewed how the stars might really and without fiction be called arbiters of the destinies of empires,—we owe to the satellites of Jupiter; to those atoms, imperceptible to the naked eye, and floating like motes in the beam of their primary—itself an atom to our sight—noticed only by the careless vulgar as a large star, and by the philosophers of former ages as something moving among the stars—they knew not what—nor why; perhaps only to perplex the wise with fruitless conjectures, and harass the weak with fears as idle as *their* theories.

* According to Delambre, this extension of Kepler's law is due to Vendelinus.

No wonder now that the eclipses of the satellites were watched with anxious, earnest interest; they were soon to afford matter for yet greater wonder and deeper contemplation. Roemer's discovery of the velocity of light from the retardation of their eclipses about the end of the 17th century, was the next in order, and the sublimest truth they were destined to be the means of unfolding; a truth so amazing, so overwhelming to human faculties, that (not to mention the feebler names of Cassini, Maraldi, and Fontenelle) even the comprehensive genius of a Hooke quailed before it, and refused to admit the existence of a motion so little short of infinite in a finite system like our own. The discovery of the aberration of light by Bradley, however, more than forty years afterwards, confirmed it in its full extent; and no truth in the circle of physical science is either more astonishing, or better established than this.

We are not yet come to the end of the long catalogue of useful and admirable results afforded to science and to mankind by the discovery of these bodies. We have hitherto regarded only obvious results; broad and evident conclusions from apparent facts. Let us now trace them in the quiet succession of their convolutions, in the unfolding of their periodical inequalities, in the slowly accumulating amount of their mutual action, in the influence of the oblate figure of their primary on their orbits; in short, through all the mazy intricacies of their perturbations. The lessons they have thus whispered to the intellect of man, over the midnight lamp, have not been less instructive, less fraught with wonder and utility, than those which they have blazoned to his senses. It is to that powerful and gifted genius, now so recently gathered in an illustrious grave; on whose ashes the tears of mourning science are yet warm,—to him, whose revered name, so freshly sanctified by death, I am unwilling to pronounce, that we owe the complete development of their theory. His penetrating mind saw all the advantages likely to accrue to the general theory of the planetary perturbations from the study of this miniature system, where years are represented by days, and ages by years, and where inequalities, which in the planetary theory have a character approaching to secular, can be traced in their increase and on their wane. Aided, therefore, by his powerful analysis, he succeeded in applying the law of gravitation to the minute investigation of all their inequalities; and the result has been not merely another triumph of the Newtonian theory in the complete explanation of all their complicated irregularities, but the formation of tables even more perfect than observation itself:* and in addition, a mass of most valuable and instructive information on the general nature of planetary perturbations, amply repaying all the labour of the inquiry, and adding fresh lustre to the already imperishable glory of his name.

This slight sketch of the history of the satellites of Jupiter may serve to shew how intimate is the connexion of distant parts of science with each other, and that in it we are to regard nothing as

* Than any single observation.—*Delambre.*

trivial, and nothing as great in itself, but in respect of the instruction we may draw from it;—to shew, in fine, how deep are the foundations and how wide-spread the ramifications of that tree of knowledge which, in the poet's words,

> ..... quantum caput ardua ad astra
> Attollit—tantum radice in Tartara tendit.

which draws its increments from small beginnings and matters of speculative curiosity, and ends in becoming the ornament, the shelter, and support of society.

It is by observations of the eclipses of the satellites alone that their theory can be compared with nature, their apparent distances from the planet being too small, and its change too slow, to admit of micrometrical measurements precise enough for the purpose, though perhaps the modern improvements both in the telescope and micrometer may authorise a hope that this may not long be an insuperable difficulty. Accordingly, from the time of Roemer downwards, a series of eminent astronomers have occupied themselves with observations of these phenomena; and it is on no less than two thousand of such observations that Delambre, improving on the tables of Wargentin by the aid of the profound theory just alluded to, succeeded in calculating the first series of tables laying claim to precision.

The longitude is so much better ascertained now by lunar distances and occultations, that these observations are less resorted to than heretofore for that purpose. Nevertheless, they are occasionally used, especially those of the first and second, whose eclipses not only happen much more frequently, but are much more definite, than those of the exterior ones. Indeed, the observations of the latter have been declared by high authority, utterly useless. It is not always good, however, to trust to authority; and Mr. South, by a comparison of his own with Colonel Beaufoy's observations, has arrived at a very different conclusion, at least for the cases when both the beginning and end of the eclipse can be seen. Still, however, it is highly desirable that they should continue to be assiduously observed, not merely to furnish corresponding observations, but to afford the means of further perfecting the tables, so as ultimately to enable us to dispense with corresponding observations altogether.

Colonel Beaufoy has for many years past been a most careful and assiduous observer of these eclipses, and indeed of all occasional phenomena; such as occultations, eclipses both solar and lunar, and of late of that very useful and important class, the transits of moon-culminating stars, of which one of his recent communications contains an extensive and highly interesting series. His observations of the immersions and emersions of the satellites communicated to this Society, amount to no less than 180, all (with the exception of two or three of the earlier ones) being made in the interval from 1818 to 1826 inclusive;—a fine series, indeed a surprising one, when the comparative rarity of the phenomena is considered, not more than about 40 visible at Greenwich occurring

annually on an average; and when the great drawback on observations of this sort from unfavourable weather in this anti-astronomical climate is taken into the account. What chiefly adds to their value as a series, however, is the circumstance of their being all made by one observer, and with one telescope,—a fine five-feet achromatic of Dollond, and with the same magnifying power, 86. In no class of astronomical observations is uniformity in this respect of such importance, since the variations in the times of appearance and disappearance, when observed at the same spot, simultaneously, by different observers with different telescopes, is found to amount not merely to a few seconds but to whole minutes.

It must be a matter of deep regret to us all, both for his own sake and for that of astronomy, that so valuable and interesting a series of observations should sustain, what I trust, however, will prove only a temporary interruption from the severe illness of Colonel Beaufoy, which alone prevents him from receiving in person the mark of our approbation adjudged him by your Council. At his request, therefore, I will hand it to our worthy Secretary.

(*Here the President delivered the medal to Mr. Stratford, as proxy for Colonel Beaufoy, at the same time thus addressing him:*—)

Mr. Stratford,

When you shall transmit this medal to Colonel Beaufoy, accompany it with the assurance of our warmest approbation of the useful and excellent example he has set, in thus steadily prosecuting from year to year, a train of observations so important in itself, and requiring so much patient and persevering attention: an example we trust to see emulated by others; since it shews how much, how very much, may be done with moderate instrumental means, by regular, systematic, and well-directed observation. He has succeeded in rendering his name conspicuous among astronomers, and his observatory a standard point of reference,—one of those zero points on earth which, like the standard stars in the heavens, will serve for the determination of innumerable others. Already we are furnished with a conspicuous instance of its use in this respect, in the determination of the longitude of Madras by Mr. Goldingham, which has this night been read to the Society, in which that important element is derived from a very moderate number of corresponding observations made at the two stations, with considerable presumption of exactness. Nor can we suppose that this will prove a solitary instance. Assure Colonel Beaufoy how much we consider science as practically benefited by his labours:—assure him too of our lively grief and sympathy for his present sufferings, and our earnest wishes and prayers that he may be speedily restored to the full enjoyment of health, to his friends, and to his favourite Astronomy.

J. Moyes, Castle Street, Leicester Square.